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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8507-2-2 (1982): Fixed insulated hermetically sealed tantalum capacitors with solid electrolyte, Part 2: Type FCST 1, Section 2: Non-polar [LITD 5: Semiconductor and Other Electronic Components and Devices]



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“Knowledge is such a treasure which cannot be stolen”



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Indian Standard

# SPECIFICATION FOR FIXED INSULATED, HERMETICALLY SEALED TANTALUM CAPACITORS WITH SOLID ELECTROLYTE

## PART 2 TYPE FCST 1

### Section 2 Non-Polar

**0. General** — This standard shall be read in conjunction with IS : 8507 ( Part 1 ) - 1977 ' Specification for fixed insulated hermetically sealed tantalum capacitors with solid electrolyte : Part 1 General requirements and methods of tests '.

**1. Outline Drawing and Dimensions** — The outline drawing and dimensions shall be according to Fig. 1 and Table 1.

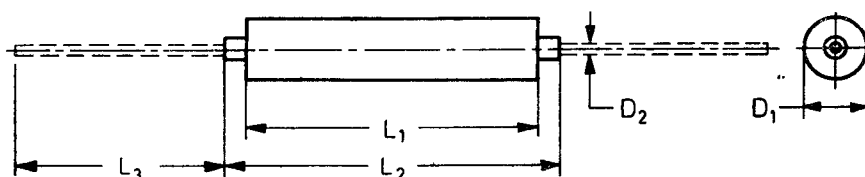


FIG. 1 NON-POLAR SOLID TANTALUM CAPACITOR

**Note** — Two equal values of polar capacitors with matched dc leakage current are connected back to back obtain a non-polar capacitor.

## 2. Ratings and Characteristics

|                               |  |
|-------------------------------|--|
| a) Rated capacitance          | See 4.1 of IS : 8507 ( Part 1 ) - 1977   |
| b) Selection tolerance        | ± 5 percent; ± 10 percent; ± 20 percent  |
| c) Rated voltage ( $U_r$ )    | See Table 2  |
| d) Category voltage ( $U_c$ ) | See Table 2  |
| e) Surge voltage ( $U_s$ )    | See Table 2  |
| f) Rated temperature          | 85°C   |
| g) Vibration                  | 10-2 000 Hz, 200 m/s <sup>2</sup> 3 x 4 h  |
| h) Bump                       | 4 000,400 m/s <sup>2</sup>   |
| j) Shock                      | 1 km/s <sup>2</sup>  |
| k) Acceleration               | 1 km/s <sup>2</sup>  |
| m) Climatic category          | 55/125/56 ( see Appendix A of IS : 589-1961 )<br>Basic climatic and mechanical durability tests for components for electronic and electrical equipment ( revised ) |
| n) Low air pressure           | 2 kPa  |

Adopted 7 September 1982

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**TABLE 1 DIMENSIONS**

( Clause 1 )

All dimensions in millimetres

| Case Size | L 1<br>$\pm 0.79$ mm | L 2<br>(Max) | L 3<br>(Min) | D 1<br>$+ 0.41$<br>$- 0.38$ | D 2                       |
|-----------|----------------------|--------------|--------------|-----------------------------|---------------------------|
| (1)       | (2)                  | (3)          | (4)          | (5)                         | (6)                       |
| AA        | 20.9                 | 27.0         | 31.75        | 3.43                        | $0.50 \pm 0.05$           |
| BB        | 30.0                 | 36.0         | 31.75        | 4.70                        | $0.50 \pm 0.05$           |
| CC        | 40.4                 | 46.5         | 31.75        | 7.34                        | $0.60 + 0.06$<br>$- 0.05$ |
| DD        | 45.8                 | 51.8         | 31.75        | 8.92                        | $0.60 + 0.06$<br>$- 0.05$ |

**TABLE RATED VOLTAGE ( $U_R$ ), CATEGORY VOLTAGE ( $U_C$ ), AND SURGE VOLTAGE ( $U_S$ )**

( Clause 2 )

| $U_R$<br>( at $85^\circ\text{C}$ )<br>V | $U_C$<br>( at $125^\circ\text{C}$ )<br>V | $U_S$<br>( at $85^\circ\text{C}$ )<br>V |
|---|--|---|
| ( 1 )                                   | ( 2 )                                    | ( 3 )                                   |
| 6                                       | 4  | 8                                       |
| 10                                      | 7  | 13                                      |
| 15                                      | 10                                       | 20                                      |
| 20                                      | 13                                       | 26                                      |
| 35                                      | 23                                       | 46                                      |
| 50                                      | 33                                       | 65                                      |
| 75                                      | 50                                       | 98                                      |
| 100                                     | 67                                       | 130                                     |

**3. Marking** — See 7 of IS : 8507 ( Part 1 ) - 1977.**4. Constructions and Workmanship** — See 5 of IS : 8507 ( Part 1 ) - 1977.**5. Classification of Tests** — See 3.1 of IS : 8507 ( Part 1 ) - 1977.**5.1 General Conditions for Tests** — See 3.2 of IS : 8507 ( Part 1 ) - 1977.**5.1.1** The test schedule and requirements shall be in accordance with Table 3.

TABLE 3 TEST SCHEDULE AND REQUIREMENTS

( Clause 5.1.1 )

| SI No.             | Test                         | Clause Ref in IS : 8507 ( Part 1 )-1977 | Condition of Test                         | Requirement  |                    |                         |            |   |           |   |           |   |
|--------------------|------------------------------|---|---|--|--------------------|-------------------------|------------|---|-----------|---|-----------|---|
| (1)                | (2)                          | (3)                                     | (4)                                       | (5)  |                    |                         |            |   |           |   |           |   |
| i) All Samples :   |                              |   |   |  |                    |                         |            |   |           |   |           |   |
| a)                 | Visual examination           | 8.4.1                                   | —   | The workmanship and finish shall be satisfactory. The marking shall be legible   |                    |                         |            |   |           |   |           |   |
| b)                 | Dimensions                   | 8.4.2                                   | —   | The dimensions of the capacitors and their terminations shall conform to values given in Table 1 used with Fig. 1  |                    |                         |            |   |           |   |           |   |
| c)                 | Capacitance                  | 8.3.2                                   | —   | The capacitance value shall correspond with the rated capacitance taking into account the tolerance  |                    |                         |            |   |           |   |           |   |
| d)                 | Tangent of loss angle        | 8.3.3                                   | —   | The value shall not exceed :<br><table><tr><td>Rated Voltage<br/>V</td><td>Tan <math>\delta</math><br/>percent</td></tr><tr><td>6.3 and 10</td><td>8</td></tr><tr><td>15 and 20</td><td>6</td></tr><tr><td>25 and 35</td><td>4</td></tr></table> | Rated Voltage<br>V | Tan $\delta$<br>percent | 6.3 and 10 | 8 | 15 and 20 | 6 | 25 and 35 | 4 |
| Rated Voltage<br>V | Tan $\delta$<br>percent      |   |   |  |                    |                         |            |   |           |   |           |   |
| 6.3 and 10         | 8                            |   |   |  |                    |                         |            |   |           |   |           |   |
| 15 and 20          | 6                            |   |   |  |                    |                         |            |   |           |   |           |   |
| 25 and 35          | 4                            |   |   |  |                    |                         |            |   |           |   |           |   |
| e)                 | Leakage current              | 8.3.1                                   | —   | Leakage current at $25 \pm 2^{\circ}\text{C}$ shall not exceed $0.04 \mu\text{A}$ per microfarad volt  |                    |                         |            |   |           |   |           |   |
| f)                 | Voltage proof                | 8.3.4                                   | —   | There shall be no breakdown or flashover   |                    |                         |            |   |           |   |           |   |
| g)                 | Insulation resistance        | 8.3.5                                   | —   | Insulation resistance shall be not less than $1\,000\text{ M}\Omega$ ,   |                    |                         |            |   |           |   |           |   |
| h)                 | Sealing                      | 8.4.10                                  | —   | There shall be no leakage of electrolyte and bubbling of gas when fully immersed in the solution   |                    |                         |            |   |           |   |           |   |
| II) First Group :  |                              |   |   |  |                    |                         |            |   |           |   |           |   |
| a)                 | Solderability                | 8.4.4                                   | —   | The tinning shall be uniform and good  |                    |                         |            |   |           |   |           |   |
| b)                 | Robustness of terminations : | 8.4.3                                   | —   |  |                    |                         |            |   |           |   |           |   |
| 1)                 | Visual examination           | 8.4.1                                   | —   | There shall be no damage   |                    |                         |            |   |           |   |           |   |
| c)                 | Bump :                       | 8.4.6                                   | 4 000, F 400 m/s <sup>2</sup>             | —  |                    |                         |            |   |           |   |           |   |
| 1)                 | Visual examination           | 8.4.1                                   | —   | There shall be no damage   |                    |                         |            |   |           |   |           |   |
| 2)                 | Capacitance                  | 8.3.2                                   | —   | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 2$ percent  |                    |                         |            |   |           |   |           |   |
| 3)                 | Tangent of loss angle        | 8.3.3                                   | —   | As per initial limits  |                    |                         |            |   |           |   |           |   |
| 4)                 | Leakage current              | 8.3.1                                   | —   | As per initial limits  |                    |                         |            |   |           |   |           |   |
| d)                 | Vibration :                  | 8.4.5                                   | 10-2 000 Hz, 200 m/s <sup>2</sup> 3 x 4 h | —  |                    |                         |            |   |           |   |           |   |
| 1)                 | Visual examination           | 8.4.1                                   | —   | There shall be no damage   |                    |                         |            |   |           |   |           |   |
| 2)                 | Capacitance                  | 8.3.2                                   | —   | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 2$ percent  |                    |                         |            |   |           |   |           |   |
| 3)                 | Tangent of loss angle        | 8.3.3                                   | —   | As per initial limits  |                    |                         |            |   |           |   |           |   |
| 4)                 | Leakage current              | 8.3.1                                   | —   | As per initial limits  |                    |                         |            |   |           |   |           |   |

( Continued )

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

| SI No.  | Test | Clause Ref in IS : 8507 ( Part 1 )-1977 | Condition of Test  | Requirement   |
|---|------|---|--|---|
| (1)   | (2)  | (3)                                     | (4)  | (5)   |
| e) Shock :                                    |      | 8.4.7                                   | —  |   |
| 1) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| 2) Capacitance                                |      | 8.3.2                                   | —  | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 2$ percent |
| 3) Tangent of loss angle                      |      | 8.3.3                                   | —  | As per initial limits   |
| 4) Leakage current                            |      | 8.3.1                                   | —  | As per initial limits   |
| f) Acceleration (Steady state) :              |      | 8.4.8                                   | 1 km/s <sup>2</sup> rigidly mounted using brackets       |   |
| 1) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| 2) Capacitance                                |      | 8.3.2                                   | —  | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 2$ percent |
| 3) Tangent of loss angle                      |      | 8.3.3                                   | —  | As per initial limits   |
| 4) Leakage current                            |      | 1.3.1                                   | —  | As per initial limits   |
| g) Rapid change of temperature :              |      | 8.5.3                                   | —  |   |
| 1) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| 2) Capacitance                                |      | 8.3.2                                   | —  | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 2$ percent |
| 3) Tangent of loss angle                      |      | 8.3.3                                   | —  | As per initial limits   |
| 4) Leakage current                            |      | 8.3.1                                   | —  | As per initial limits   |
| h) Climatic sequence :                        |      | 8.5.1                                   | —  | —   |
| 1) Dry heat                                   |      | 8.5.1.2                                 | At the maximum category temperature ( + 125°C ) for 16 h |   |
| 2) Damp heat (Accelerated) first cycle :      |      | 8.5.1.3                                 | —  | —   |
| i) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| 3) Cold* :                                    |      | 8.5.1.4                                 | At minimum category temperature of ( -55°C ) for 2 h     |   |
| i) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| 4) Low air pressure                           |      | 8.5.1.5                                 | 2 kPa  | There shall be no short circuit   |
| 5) Damp heat (Accelerated) Remaining cycles : |      | 8.5.1.6                                 | —  | —   |
| i) Visual examination                         |      | 8.4.1                                   | —  | There shall be no damage  |
| ii) Voltage proof                             |      | 8.3.2                                   | —  | There shall be no breakdown or flashover  |
| iii) Insulation resistance                    |      | 8.3.5                                   | —  | 1000 M $\Omega$ , Min   |
| iv) Capacitance                               |      | 8.3.2                                   | —  | The change in capacitance value shall not exceed $\pm 2$ percent  |
| v) Tangent of loss angle                      |      | 8.3.3                                   | —  | As per initial limits   |
| vi) Leakage of current                        |      | 8.3.1                                   | —  | As per initial limits   |

\*During the last 10 minutes of the period of exposure the rated voltage shall be applied to the specimens. No breakdown or flashover shall occur.

( Continued )

TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

| Sl No.                     | Test  | Clause Ref in IS : 8507 ( Part 1 ) - 1977 | Condition of Test   | Requirement   |
|----------------------------|---|---|---|---|
| (1)                        | (2)   | (3)                                       | (4)   | (5)   |
| III) <i>Second Group :</i> |   |   |   |   |
| a)                         | Damp heat (long term) :                     | 8.5.2                                     | To one half of the specimens rated voltage shall be applied |   |
| 1)                         | Visual examination                          | 8.4.1                                     | —   | There shall be no damage  |
| 2)                         | Voltage proof                               | 8.3.4                                     | —   | There shall be no breakdown or flashover  |
| 3)                         | Insulation resistance                       | 8.3.5                                     | —   | 1 000 M $\Omega$ , <i>Min</i>   |
| 4)                         | Capacitance                                 | 8.3.2                                     | —   | The change in capacitance value shall not exceed $\pm 2$ percent  |
| 5)                         | Tangent of loss angle                       | 8.3.3                                     | —   | As per initial limits   |
| 6)                         | Leakage current                             | 8.3.1                                     | —   | As per initial limits   |
| IV) <i>Third Group :</i>   |   |   |   |   |
| a)                         | Endurance :                                 | 8.7                                       | —   | —   |
| 1)                         | Visual examination                          | 8.4.1                                     | —   | There shall be no damage  |
| 2)                         | Capacitance                                 | 8.3.2                                     | —   | The change in capacitance value shall not exceed $\pm 2$ percent  |
| 3)                         | Tangent of loss angle                       | 8.3.3                                     | —   | As per initial limits   |
| 4)                         | Leakage current                             | 8.3.1                                     | —   | As per initial limits   |
| 5)                         | Insulation resistance                       | 8.3.5                                     | —   | 1 000 M $\Omega$ , <i>Min</i>   |
| V) <i>Fourth Group :</i>   |   |   |   |   |
| a)                         | Mould growth                                | 8.5.5                                     | —   | There shall be no mould growth  |
| VI) <i>Fifth Group :</i>   |   |   |   |   |
| a)                         | Resistance to soldering heat                | 8.4.4.2                                   | —   | —   |
| 1)                         | Capacitance                                 | 8.3.2                                     | —   | The change in capacitance value from the value recorded in SI No. i(c) shall not exceed $\pm 5$ percent |
| 2)                         | Tangent of loss angle                       | 8.3.3                                     | —   | As per initial limits   |
| 3)                         | Leakage current                             | 8.3.1                                     | —   | As per initial limits   |
| b)                         | Resistance to solvents                      | 8.4.9                                     | —   | —   |
| 1)                         | Visual examination                          | 8.4.1                                     | —   | The marking shall be legible and shall not rub off. There shall be no damage                            |
| VII) <i>Sixth Group :</i>  |   |   |   |   |
| a)                         | Characteristics at low and high temperature | 8.6                                       | —   | —   |
| ( Step 1 ) at 25°C :       |   |   |   |   |
| 1)                         | Capacitance                                 | 8.3.2                                     | —   | As per initial limits   |
| 2)                         | Tangent of loss angle                       | 8.3.3                                     | —   | As per initial limits   |
| ( Step 2 ) at — 55°C :     |   |   |   |   |
| 1)                         | Capacitance                                 | 8.3.2                                     | —   | The change in capacitance value shall not exceed $\pm 10$ percent from the value recorded at step 1     |
| 2)                         | Tangent of loss angle                       | 8.3.3                                     | —   | As per initial limits   |

( Continued )



TABLE 3 TEST SCHEDULE AND REQUIREMENTS — *Contd*

| Sl No.         | Test                     | Clause Ref in IS : 8507 ( Part 1 )-1977 | Condition of Test                     | Requirement   |
|----------------|--------------------------|---|---------------------------------------|---|
| (1)            | (2)                      | (3)                                     | (4)                                   | (5)   |
|                | ( Step 3 ) at 25°C :     | —                                       | —                                     | —   |
|                | 1) Capacitance           | 8.3.2                                   | —                                     | The change in capacitance value shall not exceed $\pm 2$ percent from the value recorded at step 1  |
|                | 2) Tangent of loss angle | 8.3.3                                   | —                                     | As per initial limits   |
|                | 3) Leakage current       | 8.3.1                                   | —                                     | As per initial limits   |
|                | ( Step 4 ) at + 85°C :   |   |                                       |   |
|                | 1) Capacitance           | 8.3.2                                   | —                                     | The change in capacitance value shall not exceed $\pm 8$ percent from the value recorded at step 1  |
|                | 2) Tangent of loss angle | 8.3.3                                   | —                                     | As per initial limits   |
|                | 3) Leakage current       | 8.3.1                                   | The category voltage shall be applied | As per initial limits   |
|                | ( Step 5 ) at + 125°C :  |   |                                       |   |
|                | 1) Capacitance           | 8.3.2                                   | —                                     | The change in capacitance value shall not exceed $\pm 12$ percent from the value recorded at step 1 |
|                | 2) Tangent of loss angle | 8.3.3                                   | —                                     | As per initial limits   |
|                | 3) Leakage current       | 8.3.1                                   | —                                     | As per initial limits   |
| b) Surge :     |                          | 8.8                                     | —                                     | —   |
|                | 1) Visual examination    | 8.4.1                                   | —                                     | There shall be no damage  |
|                | 2) Capacitance           | 8.3.2                                   | —                                     | The change in capacitance value shall not exceed $\pm$ percent                                      |
|                | 3) Tangent of loss angle | 8.3.3                                   | —                                     | As per initial limits   |
|                | 4) Leakage current       | 8.3.1                                   | —                                     | As per initial limits   |
| c) Salt mist : |                          | 8.5.4                                   | 4 days                                |   |
|                | 1) Visual examination    | 8.4.1                                   | —                                     | There shall be no corrosion or any other damage   |